



pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

42-079-00014

MEMO

TO Brian Halchak, w/o attachments
Air Quality Program
Northeast Regional Office (NERO)

FROM Darren Lauer *D.L.*
Air Quality Specialist
Source Testing Section
Division of Source Testing and Monitoring

THROUGH Charles Zadakis *CZ*
Chief
Division of Source Testing and Monitoring

Rick Begley *RB*
Chief
Source Testing Section
Division of Source Testing and Monitoring

DATE June 25, 2013

RE Source Test Review
UGI Development Company
Hunlock Creek Energy Center
Combined Cycle Combustion Turbine Unit
Nos. 5 & 6, Source ID's CT5 & CT6, respectively
Hunlock Township, Luzerne County
Plan Approval No. 40-328-006
eFacts ID No. 2109327
PFID No. 284013

UGI Development Company operates two GE LM 6000 PC-Sprint combustion turbine generators (CTG's) identified as CTG Units 5 & 6 (ID's CT5 & CT6, respectively) and two associated natural gas fired heat recovery steam generators (HRSG's) identified as Units 5 & 6 HRSG's (ID's DB5 & DB6, respectively) at its Hunlock Creek Energy Center Facility. The combined heat input capacity for each CT and its associated HRSG unit is 519.1 MMBtu/hr and the combined nominal electrical power generation capacity for each CT and HRSG unit is 65 MW. The CTG's are used for electrical power generation. Exhaust gases from each CT are routed to its associated HRSG that is equipped with a duct burner. The HRSG's operate with and without the duct burner on to produce supplemental steam used for additional electrical power generation. The CT's fire natural gas as a primary fuel and are capable of firing low sulfur distillate fuel oil and the HRSG duct burners fire natural gas. CO emissions from each CT are controlled by an oxidation catalyst and NOx emissions are controlled using water injection and a selective catalytic reduction (SCR) unit. The effluent from each unit is discharged to the atmosphere through individual exhaust stacks for each CT.

Process Data During Total PM₁₀ Test Results for CT5 - Duct Burners Firing Natural Gas:

Test Date: 8/10/12				
Run Number	1	2	3	Avg.
Run Times	08:38 to 11:45	12:10 to 15:15	15:43 to 18:47	-
Operating Load During Testing (MW) ^{1,*}	77.8	77.8	77.8	77.8
Maximum Nominal Rated Operating Load (MW)	65			
% of Maximum Nominal Rated Operating Load ¹	119.7	119.7	119.7	119.7
Fuel Flow Rate (Mscf/hr) ¹	4,876	4,863	4,855	4,865

Total PM₁₀ Test Results for CT5 - Duct Burners Firing Natural Gas:

Test Date: 8/10/12				
Run Number	1	2	3	Avg. ¹
Run Times	08:38 to 11:45	12:10 to 15:15	15:43 to 18:47	-
Volumetric Flow Rate (dscfm)	208,156	207,132	207,050	207,446 ¹
FPM _{2.5/10} Emission Concentration (gr/dscf)	0.00007	0.00005	0.00002	0.00005 ¹
FPM _{2.5/10} Mass Emission Rate (lbs/hr)	0.13	0.09	0.04	0.09
FPM _{2.5/10} Mass Emission Rate (lbs/MMBtu)	0.0003	0.0002	0.0001	0.0002
FPM _{2.5/10} Allowable Mass Emission Rate (lbs/MMBtu)	0.0141			
CPM Emission Concentration (gr/dscf)	0.00054	0.00052	0.00040	0.00049 ¹
CPM Mass Emission Rate (lbs/hr)	0.96	0.93	0.73	0.87
CPM Mass Emission Rate (lbs/MMBtu)	0.0020	0.0019	0.0014	0.0018
Total PM ₁₀ Emission Concentration (gr/dscf) ¹	0.00061	0.00057	0.00042	0.00053
Total PM ₁₀ Mass Emission Rate (lbs/hr)	1.09	1.02	0.77	0.96
Total PM ₁₀ Mass Emission Rate (lbs/MMBtu)	0.0023	0.0021	0.0015	0.0020
Total PM ₁₀ Allowable Mass Emission Rate (lbs/MMBtu)	0.0141			

Process Data During NO_x, CO, & VOC Test Results for CT5 - Ducts Burner Firing Natural Gas:

Test Date: 8/10/12				
Run Number	1	2	3	Avg.
Run Times	8:39 to 9:38	9:52 to 10:51	11:24 to 12:23	-
Operating Load During Testing (MW) ^{1, *}	77.9	77.8	77.8	77.8
Maximum Nominal Rated Operating Load (MW)	65			
% of Maximum Nominal Rated Operating Load ¹	119.8	119.7	119.7	119.7
Fuel Flow Rate (Mscf/hr) ¹	4,881	4,873	4,871	4,875

NO_x, CO, & VOC Test Results for CT5 - Duct Burners Firing Natural Gas:

Test Date: 8/10/12				
Run Number	1	2	3	Avg. ¹
Run Times	8:39 to 9:38	9:52 to 10:51	11:24 to 12:23	-
Volumetric Flow Rate (dscfm)	227,056	225,749	227,642	226,816
Oxygen (%)	13.7	13.7	13.7	13.7
NO _x Emission Concentration (ppmdv)	3.2	3.3	3.4	3.3
NO _x Emission Concentration (ppmdv, at 15 % O ₂)	2.6	2.7	2.8	2.7
NO _x Allowable Emission Concentration (ppmdv, at 15 % O ₂)	2.9			
NO _x Mass Emission Rate (lbs/hr)	5.27	5.29	5.53	5.36
CO Emission Concentration (ppmdv)	4.0	4.0	3.9	4.0
CO Emission Concentration (ppmdv, at 15 % O ₂)	3.3	3.3	3.2	3.3
CO Allowable Emission Concentration (ppmdv, at 15 % O ₂)	4.0			
CO Mass Emission Rate (lbs/hr)	3.95	3.94	3.91	3.93
VOC Emission Concentration (ppmdv, as CH ₄)	0.7	0.9	0.9	0.8
VOC Emission Concentration (ppmdv, as CH ₄ at 15 % O ₂)	0.6	0.7	0.7	0.66
VOC Allowable Emission Concentration (ppmdv, as CH ₄ at 15 % O ₂)	1.2			
VOC Mass Emission Rate (lbs/hr)	0.39	0.48	0.50	0.46

Total PM₁₀ Test Results for CT5 - No Duct Burners:

Test Date: 8/11/12				
Run Number	1	2	3	Avg. ¹
Run Times	7:34 to 10:46	11:09 to 14:13	14:31 to 17:38	-
Volumetric Flow Rate (dscfm)	208,216	206,640	208,463	207,773 ¹
FPM _{2.5/10} Emission Concentration (gr/dscf)	0.00004	0.00008	0.00005	0.00006 ¹
FPM _{2.5/10} Mass Emission Rate (lbs/hr)	0.08	0.13	0.09	0.10
FPM _{2.5/10} Mass Emission Rate (lbs/MMBtu)	0.0002	0.0003	0.0002	0.0002
FPM _{2.5/10} Allowable Mass Emission Rate (lbs/MMBtu)	0.0141			
CPM Emission Concentration (gr/dscf)	0.00039	0.00048	0.00075	0.00054 ¹
CPM Mass Emission Rate (lbs/hr)	0.70	0.85	1.38	0.98
CPM Mass Emission Rate (lbs/MMBtu)	0.0015	0.0019	0.0029	0.0021
Total PM ₁₀ Emission Concentration (gr/dscf) ¹	0.00044	0.00056	0.00080	0.00060
Total PM ₁₀ Mass Emission Rate (lbs/hr)	0.78	0.98	1.47	1.08
Total PM ₁₀ Mass Emission Rate (lbs/MMBtu)	0.0017	0.0022	0.0031	0.0023
Total PM ₁₀ Allowable Mass Emission Rate (lbss/MMBtu)	0.0141			

Process Data During H₂SO₄ & SO₂ Test Results for CT5 - No Duct Burners:

Test Date: 8/11/12				
Run Number	1	2	3	Avg.
Run Times	11:49 to 12:49	13:30 to 14:30	15:07 to 16:07	-
Operating Load During Testing (MW) ^{1,*}	73.7	72.1	72.2	72.7
Maximum Nominal Rated Operating Load (MW)	65			
% of Maximum Nominal Rated Operating Load ¹	113.4	110.9	111.1	111.8
Fuel Flow Rate (Mscf/hr) ¹	4,569	4,569	4,563	4,567

NO_x, CO, & VOC Test Results for CT5 - No Duct Burners:

Test Date: 8/11/12				
Run Number	1	2	3	Avg. ¹
Run Times	7:35 to 8:34	8:54 to 9:53	10:24 to 11:23	-
Volumetric Flow Rate (dscfm)	225,373	225,879	225,226	225,493
Oxygen (%)	14.1	14.2	14.2	14.2
NO _x Emission Concentration (ppmdv)	2.8	2.8	2.8	2.8
NO _x Emission Concentration (ppmdv, at 15 % O ₂)	2.5	2.5	2.5	2.5
NO _x Allowable Emission Concentration (ppmdv, at 15 % O ₂)	2.5			
NO _x Mass Emission Rate (lbs/hr)	4.54	4.56	4.58	4.56
CO Emission Concentration (ppmdv)	3.0	3.3	3.4	3.2
CO Emission Concentration (ppmdv, at 15 % O ₂)	2.6	2.9	2.9	2.8
CO Allowable Emission Concentration (ppmdv, at 15 % O ₂)	4.0			
CO Mass Emission Rate (lbs/hr)	2.95	3.22	3.30	3.16
VOC Emission Concentration (ppmdv, as CH ₄)	0.0	0.0	0.0	0.0
VOC Emission Concentration (ppmdv, as CH ₄ at 15 % O ₂)	0.0	0.0	0.0	0.0
VOC Allowable Emission Concentration (ppmdv, as CH ₄ at 15 % O ₂)	1.2			
VOC Mass Emission Rate (lbs/hr)	0.0	0.0	0.0	0.0

Process Data During Ammonia Test Results for CT5 - No Duct Burners:

Test Date: 8/11/12				
Run Number	1	2	3	Avg.
Run Times	7:34 to 8:38	8:53 to 10:52	10:24 to 11:29	-
Operating Load During Testing (MW) ^{1,*}	71.5	73.0	75.0	73.2
Maximum Nominal Rated Operating Load (MW)	65			
% of Maximum Nominal Rated Operating Load ¹	110.0	112.3	115.4	112.6
Fuel Flow Rate (Mscf/hr) ¹	4,564	4,567	4,562	4,564

(lbs/MMBtu)

Process Data During H₂SO₄ & SO₂ Test Results for CT6 - Duct Burners Firing Natural Gas:

Test Date: 8/9/12				
Run Number	1	2	3	Avg.
Run Times	11:37 to 12:37	13:12 to 14:12	14:44 to 15:44	-
Operating Load During Testing (MW) ^{1,*}	79.1	78.9	79.1	79.0
Maximum Nominal Rated Operating Load (MW)	65			
% of Maximum Nominal Rated Operating Load ¹	121.7	121.4	121.7	121.6
Fuel Flow Rate (Mscf/hr) ¹	4,939	4,935	4,924	4,933

H₂SO₄ & SO₂ Test Results for CT6 - Duct Burners Firing Natural Gas:

Test Date: 8/9/12				
Run Number	1	2	3	Avg.
Run Times	11:37 to 12:37	13:12 to 14:12	14:44 to 15:44	-
Sulfuric Acid Emission Concentration (gr/dscf, as H ₂ SO ₄) ¹	0.00003	0.00002	0.00003	0.00003
Sulfuric Acid Mass Emission Rate (lbs/MMBtu, as H ₂ SO ₄) ¹	0.00011	0.00008	0.00011	0.00010
Sulfuric Acid Allowable Mass Emission Rate (lbs/MMBtu, as H ₂ SO ₄)	0.0009			
SO ₂ Emission Concentration (gr/dscf) **	0.00018	0.00020	0.00020 ¹	0.00019 ¹
SO ₂ Mass Emission Rate (lbs/MMBtu) **	0.00066	0.00071	0.00072 ¹	0.00070 ¹
SO ₂ Allowable Mass Emission Rate (lbs/MMBtu)	0.0030			

** the shaded SO₂ results are inconclusive and are shown for informational purposes only

Process Data During Ammonia Test Results for CT6 - Duct Burners Firing Natural Gas:

Test Date: 8/9/12				
Run Number	1	2	3	Avg.
Run Times	7:25 to 8:29	8:38 to 9:59	10:09 to 11:12	-
Operating Load During Testing (MW) ^{1,*}	77.1	77.0	79.1	77.7
Maximum Nominal Rated Operating Load (MW)	65			
% of Maximum Nominal Rated Operating Load ¹	118.6	118.5	121.7	119.6
Fuel Flow Rate (Mscf/hr) ¹	4,938	4,960	4,948	4,949

Ammonia Test Results for CT6 - Duct Burners Firing Natural Gas:

Test Date: 8/9/12				
Run Number	1	2	3	Avg. ¹
Run Times	7:25 to 8:29	8:38 to 9:59	10:09 to 11:12	-
Volumetric Flow Rate (dscfm)	230,867	226,764	229,164	228,932
Oxygen (%)	13.7	13.6	13.6	13.6
Ammonia Emission Concentration (ppmdv, as NH ₃)	1.4	1.4	1.5	1.4
Ammonia Emission Concentration (ppmdv at 15 % O ₂ , as NH ₃)	1.2	1.1	1.2	1.2
Ammonia Allowable Emission Concentration (ppmdv at 15 % O ₂ , as NH ₃)	5			
Ammonia Mass Emission Rate (lbs/hr)	0.86	0.81	0.88	0.85

Process Data During Total PM₁₀ Test Results for CT6 - No Duct Burners:

Test Date: 8/8/12				
Run Number	1	2	3	Avg.
Run Times	7:30 to 10:32	11:00 to 14:05	14:30 to 17:36	-
Operating Load During Testing (MW) ^{1,*}	72.4	72.5	72.5	72.5
Maximum Nominal Rated Operating Load (MW)	65			
% of Maximum Nominal Rated Operating Load ¹	111.4	111.5	111.5	111.5
Fuel Flow Rate (Mscf/hr) ¹	4,565	4,563	4,587	4,572

H₂SO₄ & SO₂ Test Results for CT6 - No Duct Burners:

Test Date: 8/8/12				
Run Number	1	2	3	Avg.
Run Times	11:59 to 12:59	13:40 to 14:48	15:14 to 16:14	-
Sulfuric Acid Emission Concentration (gr/dscf, as H ₂ SO ₄) ¹	0.00001	0.00002	0.00002	0.00002
Sulfuric Acid Mass Emission Rate (lbs/MMBtu, as H ₂ SO ₄) ¹	0.00005	0.00008	0.00008	0.00007
Sulfuric Acid Allowable Mass Emission Rate (lbs/MMBtu, as H ₂ SO ₄)	0.0009			
SO ₂ Emission Concentration (gr/dscf) **	0.00018	0.00023	0.00020	0.00020
SO ₂ Mass Emission Rate (lbs/MMBtu) **	0.00069	0.00090	0.00078	0.00079
SO ₂ Allowable Mass Emission Rate (lbs/MMBtu)	0.0030			

** the shaded SO₂ results are inconclusive and are shown for informational purposes only

Process Data During NO_x, CO, & VOC Test Results for CT6 - No Duct Burners:

Test Date: 8/8/12				
Run Number	1	2	3	Avg.
Run Times	7:31 to 8:30	8:46 to 9:45	10:16 to 11:15	-
Operating Load During Testing (MW) ^{1,*}	72.3	72.3	72.6	72.4
Maximum Nominal Rated Operating Load (MW)	65			
% of Maximum Nominal Rated Operating Load ¹	111.2	111.2	111.7	111.4
Fuel Flow Rate (Mscf/hr) ¹	4564	4,557	4,566	4,562

Ammonia Test Results for CT6 - No Duct Burners:

Test Date: 8/8/12				
Run Number	1	2	3	Avg. ¹
Run Times	7:30 to 8:35	8:45 to 10:05	10:15 to 11:22	-
Volumetric Flow Rate (dscfm)	230,229	232,208	232,142	231,526
Oxygen (%)	14.3	14.3	14.2	14.3
Ammonia Emission Concentration (ppmdv, as NH ₃)	1.5	1.5	1.3	1.4
Ammonia Emission Concentration (ppmdv at 15 % O ₂ , as NH ₃)	1.3	1.3	1.2	1.3
Ammonia Allowable Emission Concentration (ppmdv at 15 % O ₂ , as NH ₃)	5			
Ammonia Mass Emission Rate (lbs/hr)	0.92	0.92	0.81	0.88

¹ reviewer calculated or corrected values or averages based upon the reported data

* MW load data is not corrected by the company for ambient conditions

cc: AIMS/AKB, w/o attachments

EPA/AKB, w/o attachments

Reading File, Source Testing Section, w/o attachments

cc: V. Trivedi, New Source Review Section, Division of Permits